

REMARKS

Claim 28 has been canceled, and new claim 31 has been added. No new matter was added. Thus, claims 1-3, 7, 8, 13-27 and 29-31 are pending for prosecution. Applicants submit arguments for overcoming the rejections of independent claims 1, 7 and 8 over the prior art of record. Accordingly, Applicants respectfully submit that the present application is in condition for allowance.

I. Claim Rejections - 35 USC §102(b)

In the non-final Office Action dated October 6, 2008, claims 1-3, 7 and 13-18 are rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 6,331,233 B1 issued to Turner.

(a) Turner

Turner discloses a tantalum sputtering target having a “recrystallized microstructure”.

For example, on column 4, lines 4-8, Turner states:

“The forged billet should then be annealed in an inert atmosphere, preferably vacuum, at a high temperature (1500°F-2800°F), preferably between 2200°F and 2400°F, in order to achieve a **recrystallized microstructure**.”

On column 4, lines 10-12, Turner then teaches that the billet/plate is subjected to a “second high-temperature inert atmosphere anneal” which is identical to the one used above for achieving a “recrystallized microstructure”. In addition, on column 4, lines 14-16, Turner requires a third and final recrystallization annealing step and states:

“... followed by a final inert atmosphere anneal (1500°F-2800°F) to **recrystallize the microstructure**...”

Accordingly, there can be no doubt that Turner teaches a tantalum sputtering target having a fully recrystallized structure.

(b) The Present Invention

A significant limitation recited by independent claims 1 and 7 of the present application is that the tantalum sputtering target and method of making the tantalum sputtering target provide the target with a **non-recrystallized structure**, which is the exact opposite of that taught by Turner. This is also stated in the present application, as filed. For example, see page 3, lines 7-13, of the present application, as filed, which discusses Turner and states:

“And, when performing sputtering, since it is said that the finer and more uniform the **recrystallized structure** of the target, and more uniform the crystal orientation thereof, a more uniform deposition is possible, and a film generating few arcings and particles having stable characteristics can be obtained. Thus, measures for making the **recrystallized structure** fine and uniform, and arranging it to be a specific crystal orientation are being taken (e.g., refer to Publication of Translation of International Application No. 2002-518593, **U.S. Patent No. 6,331,233**).”

A detailed explanation concerning the “mechanism of recrystallization” is provided on page 3, lines 14-28, of the present application, as filed. Strain is accumulated within primary crystals due to plastic working. The strained primary crystals form a network cell structure with different orientations aggregated with lattice defects and are separated into a plurality of different areas with significantly differing orientations. When this kind of deformed structure is heated during a recrystallization annealing process, **first**, the cells transform into subgrains during a recovery process through a combination of transition and rearrangement, **and after the recovery process**, these subgrains combine, and a specific subgrain grows to become a recrystallized core. **Thereafter**, the recrystallized core corrodes the non-recrystallized portions, grows, and promotes full recrystallization. As best stated on page 4, line 1-2, of the present application, as filed, prior art such as Turner teach that “a **fully recrystallized structure** based on full annealing is favorable in stabilizing the structure.”

However, the present inventors disagree with the conventional teaching concerning the requirement that the tantalum sputtering target have a fully recrystallized structure and teach the opposite to that taught by Turner. The present invention requires the sputtering target to have a non-recrystallized structure (which, of course, is the exact opposite of a fully recrystallized structure). For example, see page 7, lines 7-10, of the present application, as filed, which states:

“... what is especially important in the present invention is to obtain a target material ultimately subject to plastic working such as cold rolling, or to refrain from conducting sufficient recrystallization so as to **leave the processed structure after the final processing step.**”

As best stated on page 8, lines 1-2, of the present application, as filed, the final annealing step of the present invention simply alleviates warping of the target and does not recrystallize the target. For instance, as stated on page 8, lines 4-5, of the present application, as filed, the structure of the target obtained is **a non-recrystallized structure and a processed structure remains therein.** A more detailed explanation is described on page 8, lines 12-20, of the present application, as filed, which refers back to the discussion concerning the “mechanism of recrystallization” initially discussed on page 3 of the present application. For example, page 8, lines 12-20, of the present application, as filed, states:

“Although **recrystallization does not occur** ..., it is considered that the structure during the stage midway to recrystallization; that is, during the subgrain (recovery process) stage, occurs ... With these subgrains, the strain added to the object is absorbed in the primary crystals by the transgranular slip in a certain direction, the strain is accumulated therein, and the subgrains have a structure before the crystal growth separated into different regions in slightly different directions divided with a plurality of transitions in this strained primary crystal.”

Accordingly, the “**first**” step in which cells transform into subgrains during a recovery process through a combination of transition and rearrangement occurs. However, the step **after the recovery process**, in which these subgrains combine and a specific subgrain grows to become a recrystallized core, does not occur according to the present invention. Of course, the

further steps of permitting the recrystallized core to corrode the non-recrystallized portions, to grow, and to promote full recrystallization also do not occur. As best stated on page 8, lines 22-23, of the present application, as filed, the present invention provides a tantalum sputtering target with “a unique structure having subgrains that is clearly different from a recrystallized structure” taught by Turner.

(c) Rejection

Despite this clear structural difference, independent claim 1 of the present application, which requires a “tantalum sputtering target having a non-recrystallized structure”, is rejected based on Turner for the following stated reason:

“Turner differs from instant claim 1 because it does not specifically teach that the tantalum sputtering target has a non-recrystallized structure. However, col. 2 lines 39-63 of Turner teach that the tantalum sputtering target has a homogeneous fine-grain size microstructure with a uniform, predominantly {111} texture. Therefore, the tantalum sputtering target of Turner has a predominately non-recrystallized structure. In addition, it would be expected that the tantalum target of Turner would inherently have a non-recrystallized structure since it is made using a method similar to the method of the instant invention.”

Independent claim 7 of the present application, which requires a method that provides the “tantalum sputtering target with a non-recrystallized structure” is rejected based on Turner for the identical reasoning:

“Turner differs from instant claim 7 because it does not specifically teach that the tantalum sputtering target has a non-recrystallized structure. However, col. 2 lines 39-63 of Turner teach that the tantalum sputtering target has a homogeneous fine-grain size microstructure with a uniform, predominantly {111} texture. Therefore, the tantalum sputtering target of Turner has a predominately non-recrystallized structure. In addition, it would be expected that the tantalum target of Turner would inherently have a non-recrystallized structure since it is made using a method similar to the method of the instant invention.”

(c) Patentability Argument

A claim of a patent application is anticipated under 35 USC §102 only if each and every element is found described in a single prior art reference. **The identical invention must be shown in as complete detail as contained in the claim.** The elements identified by the reference must be arranged as required by the claim. If a prior art reference relied on in a rejection made under 35 USC §102 does not contain every element recited in the claim in as complete detail as is contained in the claim and arranged as recited in the claim, the rejection is improper.

Turner discloses a tantalum sputtering target having a **recrystallized structure**. Turner fails to disclose a tantalum sputtering target having a **non-recrystallized structure**. For example, on column 4, lines 4-8, Turner states:

“The forged billet should then be annealed in an inert atmosphere, preferably vacuum, at a high temperature (1500°F-2800°F), preferably between 2200°F and 2400°F, in order to achieve a **recrystallized microstructure**.”

On column 4, lines 10-12, Turner then teaches that the billet/plate is subjected to a “second high-temperature inert atmosphere anneal” which is identical to the one used above for achieving a “recrystallized microstructure”. In addition, on column 4, lines 14-16, Turner requires a third and final recrystallization annealing step and states:

“... followed by a final inert atmosphere anneal (1500°F-2800°F) to **recrystallize the microstructure**...”

Accordingly, there can be no doubt that Turner teaches a tantalum sputtering target having a fully **recrystallized** structure. For at least this reason, Applicants respectfully submit that Turner fails to anticipate independent claims 1 and 7 of the present application under 35 USC §102. Turner fails to disclose the identical invention in as complete detail as contained in claims 1 and 7 of the present application.

In addition, Applicants respectfully submit that it is an error to reason that:

“... the tantalum sputtering target of Turner has a predominately non-recrystallized structure. In addition, it would be expected that the tantalum target of Turner would inherently have a non-recrystallized structure since it is made using a method similar to the method of the instant invention.”

The only structure disclosed and taught by Turner is a fully recrystallized structure which is the opposite of a non-recrystallized structure. In addition, one of ordinary skill in the art following the teachings of Turner would not “expect” the tantalum target of Turner to “inherently” have a non-recrystallized structure. Rather, Turner’s description of a tantalum sputtering target having a homogeneous fine-grain size microstructure with a uniform, predominantly {111} texture clearly mandates a fully recrystallized structure. Finally, the method of producing a tantalum sputtering target taught by Turner is clearly not the same as the present invention because Turner clearly teaches a final inert atmosphere anneal (1500°F-2800°F) sufficient to “**recrystallize the microstructure**”.

Accordingly, Applicants respectfully request reconsideration and removal of the 35 USC §102(b) anticipation rejections of independent claims 1 and 7 and dependant claims 2, 3 and 13-18.

II. Claim Rejections - 35 USC §103(a)

In the non-final Office Action dated October 6, 2008, claims 8 and 19-30 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,331,233 B1 issued to Turner.

Independent claim 8 has been amended to include a limitation that is stated in claim 7, discussed above, and that was stated in canceled claim 28. Thus, as amended, independent claim 8 requires a method that provides the “tantalum sputtering target with a non-recrystallized structure”. No new matter was added.

Accordingly, Applicant respectfully submits that claim 8 is patentable over Turner for the same reasons discussed above concerning the patentability of claims 1 and 7 over Turner.

Turner fails to disclose a tantalum sputtering target having a non-recrystallized structure and a method step of producing a tantalum sputtering target having a non-recrystallized structure.

In addition, Turner not only fails to teach a tantalum sputtering target and method in which a non-recrystallized structure is provided, Turner also teaches away from such a structure and process step. "Teaching away" is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, "teaching away" is a per se demonstration of lack of obviousness. In re Fine, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

As discussed above, Turner teaches a "final inert atmosphere anneal (1500°F-2800°F) to **recrystallize the microstructure**". Thus, one of ordinary skill in the art is clearly taught by Turner to recrystallize the tantalum sputtering target during a final inert atmosphere anneal. Accordingly, one of ordinary skill in the art following the teachings of Turner would fully anneal the target structure so as to fully recrystallize the target structure. This is the exact opposite of that required by claim 8, as amended, of the present application.

Further, one of ordinary skill in the art following the teachings of Turner would not "expect" the tantalum target of Turner to "inherently" have a non-recrystallized structure. Rather, Turner's description of a tantalum sputtering target having a homogeneous fine-grain size microstructure with a uniform, predominantly {111} texture clearly mandates a fully recrystallized structure.

Still further, the method of producing a tantalum sputtering target taught by Turner is clearly not the same as the present invention because Turner clearly teaches the use of a final inert atmosphere anneal sufficient to "**recrystallize the microstructure**".

Accordingly, Applicants respectfully request reconsideration and removal of the 35 USC §103(a) obviousness rejection of independent claim 8, as amended, and dependant claims 21-27, 29 and 30.

Dependent claims 29 and 30 provide additional reasons for patentability. The temperatures recited in claims 29-30 do not overlap those of Turner. No new matter was added; for example, see page 12, Table 1, Examples 1-3 of the present application, as filed.

New dependent claim 31 also provides an additional reason for patentability. No new matter was added; for example, see page 6, line 21, of the present application, as filed.

III. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

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